



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/084,688	02/27/2002	Lee Chow	UCF-293	6411
23717	7590	07/02/2004	EXAMINER	
LAW OFFICES OF BRIAN S STEINBERGER 101 BREVARD AVENUE COCOA, FL 32922			PADGETT, MARIANNE L	
			ART UNIT	PAPER NUMBER
			1762	
DATE MAILED: 07/02/2004				

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/084,688

Applicant(s)

CHOW ET AL.

Examiner

Marianne L. Padgett

Art Unit

1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 February 2004.
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3 and 15-33 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1,3 and 15-33 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 2/27/02 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Art Unit: 1762

1. Claims 1, 3, 15-17, 20-24 and 27-31 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term “nano” remains relative term, as applicant has provided no clear metes and bounds, nor definition for the word’s scope. The substitution of “nano sized” for “nano scale” is a semantics change, with no substance, as the same objections made on page 2, section 2 of the action of Paper No. 5, mailed October 22, 2002, still apply. Applicant’s apparent argument that “the phrase ‘nano size’ ... is used throughout the specification” does not provide clear metes and bounds, if no definition is provided by the specification. An example or possible size range is NOT a necessary meaning, hence cannot provide the needed metes and bounds, none of which did applicant make any attempt to point out with specification or provide from relevant prior art.

Note claims that provide dimensions are not included in this rejection, as these claims further define the limitation “nano sized” such that it has clear bounds.

2. Claims 15-18, 20-33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 15, it is unclear when and how one uses the “bi-metal junction” that is not yet made or is being made to measure temperature. After one forms something, such as a sensor that is to function as a thermocouple, one can use it, but then that is use of the product, not part of its manufacture. In claims 16-17 it is uncertain how one can provide the thermocouple with the claimed sensitivity, if one did not make it to have that sensitivity in the first place. Is this intended to be a post-deposition treatment or a statement of the properties that the procedures of step (a)-(c) produce, or does use of the thermocouple as in claim 15, change its properties? Also see claims 22-24 and 29-31.

Art Unit: 1762

A strip is an object with a length that may or may not be continuous, as relatively thin thickness or depth, and a width. It is not generally described as having a diameter (which is defined as the cord passing through the center of a body or a figure, by Webster's). If one insists on using diameter to describe a strip's dimension, when it is not really the appropriate term, there are three very different dimensions that can be defined as "diameter", since one needs only pass the line defining it through the strip's center, i.e. any of length, depth or width may read on diameter. It seems improbable that applicants' intended such in claims 18, 25 and 32; hence clarification of language used might be considered. Given the context of the claim, --a width--would appear more appropriate than "a diameter", but applicants should show support for any amendments made.

Note in claims 19, 26, 33 or in related discussion on the cross-sectional area that uses similar language on page 3, lines 15-20 of the specification, logic supports the "diameter" being intended to be the width of the strips; since if two strips cross or overlap at right angles, the width would provide the cross sectional area, so the $50 \times 50 \text{ nm}^2$ area suggests or supports width, especially considering depth would have just added thickness ($50+50$), and if length = diameter (d) then the resultant cross-section from $d=50$ would have been much smaller than disclosed. However, looking at Fig. 1A, where Pt strip 9 has a width of 50 nm, (or is it depth?), then assuming strip 8 of W is also 50 nm, the side-by-side, dimension is 100 nm for the cross-section and the overlapping edges of the length unknown.

Claim 20 is self contradictory, as it defines "a second...strip" as being "a ball shaped portion". A stripe and a ball are two entirely different geometrical objects that have absolutely no overlapping meaning, and cannot be reconciled. There is not even any way the overlap (which is not what was claimed) of two strips can be called a ball, which is a sphere. In two dimensions, the overlap of two strips is a square, a rectangle or a parallelogram, in three dimensions with depth; it's a cube, etc. The examiner will agree that with heating and fusing of 2 overlapping strips of about equal width, where their individual depths are about $\frac{1}{2}$ (width), in small enough dimensions the edges of the overlapping portion will not be

Art Unit: 1762

sharp, so the ideal of the cube will tend towards a ball or a sphere, but this is NOT what was claimed, but the deposited "strip" was claimed to be "ball shaped"! Step (c) does not make sense as written, especially with the context of step (b), as it has "the ball shaped portion" being something separate, i.e. between, the first and second strips, not part of or a combination of them where they overlap, where this latter, is what the examiner suspects was intended. Also note that "ball shaped" or "point shaped" in 27, implied that the "shape" need not be exactly a ball or a point, respectively, but exactly what the scope of the range of shapes includes is not defined.

Claim 27 has an analogous contradictory discrepancy, in that the "second...strip" is being claimed to have "a point shaped configuration", with its step (c), again saying it is "between" the two strips. In either claims 20 or 27, would language such as --, such that overlap of said first strip and second strip forms a ball shaped portion-- or --...point...portion--, substituted for "in...portion" supply intended meaning in steps (b)? Then in steps (c) would inserting --where overlapping occurs-- before "between", also provide intended meaning? While the language would be logical, it is not clear that it is consistent with Fig. 1B (reference No. 4=ball) or 1C (reference No. 6=point), described on page 4, lines 20-23, which were the only support for this amendment of applicants, found in the specification. The orientation of Figures 1A-C with respect to the substrate is not defined, and in B and C only, the ball portion of 4 or location of the point 6 are defined, with none of the other 4 strips of whatever being described in the text nor by reference numbers.

3. The drawings are objected to because according to page 5, lines 12-15, Fig. 4 is directed to conventional thermocouples properties, hence the Figure should be labeled "Prior Art," and the description on line 3 of page 3, should indicate it is conventional. Applicant might also consider correcting the above noted deficiencies in Figures 1B-C, if they can justify support for any changes.

Corrected drawing sheets are required in reply to the Office action to avoid abandonment of the application. Any amended replacement-drawing sheet should include all of the figures appearing on the

Art Unit: 1762

immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the examiner does not accept the changes, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

4. Claims 15-17, 22-24, 26, 29-31 and 22 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Applicant cited no support for their amendments, and review of the specification did not provide support for all features of these claims as written. No disclosure of sensing temperature at the junction being formed, during the production process was found in the specification, hence this claim contains New Matter. End-use as a thermocouple is disclosed, but that is not the same as a step during manufacture.

The only mention of sensitivity of "approximately 0.04 mV/degree C Centigrade" was found on page 5, lines 12-15 and it is for a prior art thermocouple, and NOT disclosed as a lower limit for products of the inventive process, hence the claimed ranges based thereon in claims 16, 23 and 30 are New Matter.

Page 5, lines 16-21 compare the conventional thermocouple to data from applicants' FIB fabricated nano-sensor of Fig. 5, teaching sensitivity "approximately 130 times more than the

Art Unit: 1762

conventional thermocouple”, i.e. $0.04 \times 130 = 5.2 \text{ mV/}^\circ\text{C}$. The last two lines of the abstract have similar teachings, and give the value $5.4 \text{ mV/}^\circ\text{C}$, therefore in claims 17, 24 and 31 the “at least” portion of the claimed sensitivity range also appears to constitute New Matter, in that the values greater than the disclosed amount noted above are not supported.

It is further noted that Fig. 5 does not say of what metals the FIB fabricated thermocouple is made, but assuming the example on page 4, line 24-page 5, line 2, using W and Pt provides the data for Fig. 5, then not just different technique (FIB vs. undisclosed), but different materials are being compared in Figures 4 and 5, and page 5, lines 12-21, hence no conclusions can be drawn or supported than that the thermocouple of Fig. 4 has about $0.04 \text{ mV/}^\circ\text{C}$ sensitively and that of Fig. 5 has about $5.2 \text{ mV/}^\circ\text{C}$, where its probably W/Pt, but we cannot be sure from the disclosure, nor can we say what properties a FIB deposited thermocouple of metals other than those used for the Fig. 5 data will produce.

While page 3, lines 15-20 disclosure 50 nm strip “diameter” (maybe equivalent to width) also shown in Fig. 1A, with junction area therefrom of approximately $50 \times 50 \text{ nm}^2$, it is unclear if this area can appropriately be applied to the claimed “ball shape” or “point shaped configuration” of the claims of 20 or 27, hence 26 or 33, since as illustrated it is unclear if or how the strips participate in their formation, hence whether the area disclosure of lines 15-17 properly applies to these variations.

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 1762

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Nishioka et al (4,853,341), discussed in sections 5-6 of paper#5, mailed 10/22/02.

Applicants' amendments to this claim have not removed Nishioka et al, since the "very fine patterns in the submicron order" (col. 9, lines 25-68, esp. 29, 47 and 60-61 etc.) and line or band shaped electrically conductive deposits made by FIB, such as from $W(CO_3)_6$ to form a first metal film 105, that is 300 nm wide read on claimed limitations. The amendment requires the first and second metal strips to be of different metals, however, Nishioka et al subsequently FIB deposited, partially overlapped metal layers that may be represented 3rd or 4th embodiments, have the option of being of different metals, such as Mo and W (column 9, lines 53-68 and column 10, lines 45-55). Note, since a differential etching process may be used in later steps that removes portions of Niskioka first metal, but not exposed second metal (column 11, lines 14-210, this is further evidence that the metals are different as claimed.

Applicants have added a step of "forming a bi-metal sensing junction..." and argued that due to the title of Nishioka et al, and a quote said to be from column 3, lines 10-14, in the background but which is NOT there, that Nishioka et al is limited to simple electrical connections, and does not read on the claimed sensor/or junction. This is not agreed with, since the Nishioka et al analysis electrode 4 is constituted by both first and second metals, both which may be FIB deposited, thus it is made of a bi-metal, it is a junction of 2 metals, consistent with claimed limitations, and an analysis electrode is a kind

Art Unit: 1762

of sensor. Claim 1 does not require the sensor to be used for any particular kind of enduse or purpose; it just requires a structural and material configuration that is met by Nishioka et al. Note that further processing, such as removal of parts of the reference's first metal layers are not excluded by applicants' claims, and could even be considered part of the forming step, which has no necessary actions, or differences from step (b).

7. Claims 18-19, 20, 25-27 and 32-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishioka et al.

The claimed shaped portions of ball or point configurations, are not clear as written (see above section 2), and cannot be more meaningfully treated until given a clear context. However, lacking any significance effects from their particular shape, ball and point may be relative to prospective, and the shape edges of the diagrams would have been expected by one of ordinary skill to be more rounded thus approach being "ball shaped", or a very small feature may be considered to approach being "point-shaped", hence depending on design considerations or prospective "ball-shaped" or "point-shaped" may be considered obvious configuration variations.

Exact sizes of 50 nm "diameter" nor 50x50 nm² area are not disclosed, however the metal deposits are taught to be formed at predetermined shape and size (column 4, lines 25-28; column 7, lines 50-55; column 8, lines 4-14⁺) with an employ size of 300 nm, hence it would have been obvious for one of ordinary skill in the art to use submicron dimensions as taught, and optimize them for the particular enduse, which would have been expected to include claimed values, especially considering the long standing trend towards maximum feasible miniaturization.

8. Claims 3, 15-17, 21-24 and 29-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishioka et al as applied to claims 1, 19-20, 25-27 and 32-33 above, and further in view of Tombrello et al (4,526,624) and Tao et al (5,104,684).

Art Unit: 1762

Nishioka et al while making an "analysis electrode", does not suggest that this sensor be a thermocouple, which would appear to be the intended requirement of some these claims, nor require the combination of W and Pt as the two metals employed. Tombrello et al teach that some metals, such as noble metal which form weakly adherent bonds, may be more firmly bonded to other non-insulating layers when energetic ion bombardment is employed and suggest that such treatment is advantageous in forming bi-metallic thermocouples, and with metals such as Au or Pt. Note that Nishioka et al's example on column 5-6, employs gold (Au) as the first metal in the analyzing electrode 4 (column 6, line 13), but not via FIB, but does deposit the subsequent W or Mo via FIB, showing that the FIB technique produces the types of adherence to noble metal as suggested is needed by Tombrello et al for bi-metal thermocouple formation, hence it would have been obvious to one of ordinary skill in the art to employ Nishioka et al's bi-metal layer FIB technique for producing sensors as suggested by Tombrello et al, especially considering Tao et al (abstract; column 1, lines 9-17 and 48-55; summary; column 3, lines 3-12 and 28-62 and column 4, lines 49-65; column 6, lines 8-26), who discloses use of a Ga ion beam as used in Nishioka et al to deposit submicron lines of Pt, with background disclosure that Au processor are also know to be used in FIB deposition. Thus, Tao et al demonstrates that noble metals, as suggested for use in thermocouples are known to be deposited by FIB techniques as employed by Nishioka et al, hence it would have been further obvious to use the FIB technique that produces adherent deposits that are required for such bi-metal constructions.

9. Other art with FIB techniques of interest include Gavish (6,638,580 B2) and Kane et al (6,630,395 B1).

10. Applicant's arguments filed February 26, 2004 and discussed above have been fully considered but they are not persuasive.

Art Unit: 1762

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

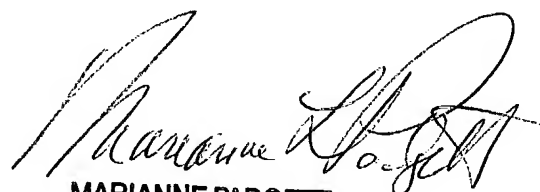
A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

12. Any inquiry concerning this communication from the examiner should be directed to Marianne L. Padgett whose telephone number is (571) 272-1425. The examiner can generally be reached on Monday-Friday from about 8:30 a.m. to 4:30 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (571) 272-1415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

M.L. Padgett/dh June 16 & 30, 2004


MARIANNE PADGETT
PRIMARY EXAMINER